

# Bamboo Health



## Up Front, Every Patient, Every Time

A MODEL FOR MAXIMUM PDMP EFFECTIVENESS

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May 2019

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**SUMMARY**



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# Up Front, Every Patient, Every Time

**PMP AWARE<sup>x</sup>E<sup>®</sup>**

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**PMP Aware, released in 2011 is the first scalable, modern PDMP platform deployed with a national level footprint. Currently operating, or being deployed, to 42 of the 52 PDMP programs in existence.**



**PMPInterconnect, released in 2011 allows for interstate PDMP data sharing at no cost to participating states. 45 states now actively and seamlessly share data across state lines. The platform currently processes more than 18 million requests and 39 million responses per month.**

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## **PRESCRIPTION DRUG MONITORING PROGRAM (PDMP) OVERVIEW**

Many of today's practicing clinicians view PDMPs as modern creations but the first PDMP was started in New York in 1918 and the longest continuously running state program began in 1939 in California. How amazingly prescient those early adopters were. Today, there are 52 state, county, and territory-based PDMP programs in existence.

Historically, the basic function of a PDMP has been to act as an aggregator and disseminator of controlled substance dispensing information. Controlled substances such as opioids and benzodiazepines, among other drug types, represent the core of the nation's drug epidemic. Many PDMPs started as law enforcement tools, but most have migrated to a clinical decision support focus with hopes that providers and pharmacists will more carefully consider and manage the risks and benefits of opioids and other controlled substances. Modern PDMPs experienced initially slow adoption rates due primarily to logistical issues around access, performance, and quality control. Those early problems have been largely addressed with modern, scalable technologies to curate and manage the PDMP data and another set of technologies that integrate the PDMP into provider and pharmacist workflow.





## PMP Gateway®

**PMP Gateway, released in 2011 is a single point integration option for PMP InterConnect, allowing for in-workflow, one-click access to multi-state PDMP data. Currently used across the country, it delivered PDMP data into workflow 288,000,000 times in 2017.**

With data quality and access issues largely solved, the next pressing issue is how to maximize the clinical effectiveness of the PDMP. Many mandatory use laws have been created that require providers and pharmacists to check the PDMP in certain circumstances. Some of these mandatory check situations include; first prescriptions, prescriptions above a certain quantity, and at set intervals during chronic therapy. Beyond these mandatory use requirements, it is up to the provider or pharmacist to decide when else a check of the PDMP might be appropriate. In a best case scenario, the PDMP would be used wherever and whenever it could inform providers and improve the care they deliver to patients.





**The history component of the H&P has been repeatedly found to provide the greatest single impact in making a correct diagnosis.**

## **BAMBOO HEALTH APPROACH**

With few exceptions, America's drug problem cuts across all social, cultural, age, sex, and economic divisions. The problem has been classified as an epidemic and is likely the major health crisis of our time. Bamboo Health's approach to maximizing PDMP effectiveness can be summarized as follows: Up front, every patient, every time.

### **UP FRONT: PDMP INFORMATION SHOULD BE AVAILABLE AT THE BEGINNING OF THE PATIENT ENCOUNTER.**

This approach allows the provider to incorporate the PDMP information into the History and Physical Exam which collectively are known as the H&P. The H&P is typically the first step in evaluating a patient and classical teaching is that history alone is up to 90% of the diagnosis. As testing quality and availability have improved over the years, there has been interest in challenging the importance of history and physical exam in making a correct diagnosis. Even in the modern era, history is the most powerful diagnostic tool, especially when combined with physical exam and basic testing.

Given that an H&P occurs early in the process, an automated query of the PDMP is the best method to guarantee availability when and where the information is most needed. This type of methodology relies on electronic health record (EHR) trigger events, such as registration, or chart opening, to cause a cascade of machine to machine interactions that result in a PDMP query on behalf of the treating provider. Ideally, this query will automatically survey multiple states simultaneously to obtain a comprehensive PDMP history for the patient.



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# 40M+

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**Elderly patients account for nearly 20 million ED visits and more than 40 million opioid prescriptions per year. Opioids quintuple fall risk, cause urinary retention, cause constipation and nausea, alter mental status, and are arrhythmogenic. Ascertaining the potential role of opioids in these common complaints is essential to proper diagnosis.**

## **EVERY PATIENT:**

### **MAKE PDMP INFORMATION AVAILABLE FOR EVERY PATIENT.**

This approach recognizes that America's drug epidemic cuts across all demographics. While this is generally accepted *prima facie*, some might argue that the very young can be excluded but PDMP analyses do not back this up. As an example, New Mexico's PDMP published a report in 2013 showing that 5% of patients aged 5-14 years had received an opioid prescription in the last year. The FDA estimates that in 2015, about 4% of all patients receiving an opioid prescription were less than age 17, amounting to approximately 2.5 million individuals.

## **EVERY TIME:**

### **MAKE PDMP INFORMATION AVAILABLE EVERY TIME THE PATIENT IS SEEN.**

The PDMP should be used to answer or substantiate the answer to several basic healthcare questions, some (or all) of which should be evaluated at every encounter.

- Is this patient opioid naive?
- Is this patient using controlled substances frequently or chronically?
- Is the patient's pattern or level of controlled substance use concerning?
- Is this patient at risk of overdose and in need of immediate help?

Given the prevalence of use (and misuse) of prescription drugs in America, all of the above questions are important for every provider to ascertain at every encounter, not just those encounters when a prescription may be contemplated. Detecting use, or misuse at the earliest possible intervention point is critical to minimizing adverse outcomes.



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NARX SCORES		
Narcotic	Sedative	Stimulant
633	280	000

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**NarxCare Scores are numerical representations of PDMP data that can be displayed within the native EHR or pharmacy management system. Stored as discrete data, they can be leveraged into algorithmic clinical decision support or retrospectively viewed for trend analysis.**

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## NARXCARE

Bamboo Health created NarxCare to facilitate the goals of “Up front, every patient, every time”.

Briefly, NarxCare is a substance use disorder platform that can be integrated into a PDMP, and also into workflow using a standard API. When integrated, NarxCare automatically delivers four numerical representations of risk and use when a patient first presents for care.

An Overdose Risk Score (ORS) is presented as 3 digits ranging from 000-999 and is highly correlated with the risk of unintentional overdose death. This score was modeled and tested against more than 5,000 overdose deaths and can be used to identify those patients who have 300 times greater risk of death. The details of this score are discussed in a separate white paper.

Numerical use representations are also presented as 3-digit scores ranging from 000-999. A separate use score is reported for narcotics (opioids), sedatives, and stimulants and can be easily referenced during normal workflow. These scores serve to trigger awareness of the quantity and quality of type-specific PDMP information available for review. When the NarxCare scores raise awareness to the need to look further, providers can access the platform with a single click and view prescription level details.

Embedded within the NarxCare report interface are tools that can be used to coordinate care and actively manage a patient’s risk or need for referral.



**Rx Data**

**PRESCRIPTIONS**  
 Total Prescriptions: 8.00  
 Active MME: 300.00  
 Active MME/day: 25.00  
 30 Day Avg. MME/day: 11.33

Fill Date	ID	Drug	Qty	Days	Prescriber	Pharmacy	Refill	MgEq	MgEq/Day	Pymt Type	PMP
03/19/2018	1	HYDROMET SYRUP	180	9	Ke Hol	Kroger	0	180.00	20.00	Commercial PBM	OH
03/12/2018	1	HYDROCODONE-HOMATROPINE SYRUP	120	24	He Har	Kroger	0	120.00	5.00	Commercial PBM	OH
02/22/2018	1	ALPRAZOLAM 0.25 MG TABLET	30	30	Ke Hol	Kroger	0	15.00	-	Commercial PBM	OH
02/22/2018	1	HYDROMET SYRUP	120	24	Ke Hol	Kroger	0	120.00	5.00	Commercial PBM	OH
01/09/2017	1	OXYCODONE-ACETAMINOPHEN 5-325	40	4	He Ray	Kroger	0	300.00	75.00	Commercial PBM	OH
11/19/2016	1	OXYCODONE-ACETAMINOPHEN 5-325	40	4	He Ray	Kroger	0	300.00	75.00	Commercial PBM	OH
09/19/2016	1	OXYCODONE-ACETAMINOPHEN 5-325	50	8	He Ray	Kroger	0	375.00	46.88	Commercial PBM	OH
07/19/2016	1	ALPRAZOLAM 0.25 MG TABLET	30	30	Ke Hol	Kroger	0	15.00	-	Commercial PBM	OH

**PROVIDERS**  
 Total Providers: 3

Name	Address	City	State	Zipcode	DEA
Hart, Heather	7495 Burning Line	Post Town Heights	OH	44433-2013	235135
Holmes, Keith	5987 Bright Street	Acme	OH	43703-9597	235136
Ray, Henry	4127 Red Oak Farm	Ridgeway	OH	43136-8775	235134

**PHARMACIES**  
 Total Pharmacies: 1

Name	Address	City	State	Zipcode	DEA
Kroger	3582 Middle Place	Dixie	OH	44577-6445	346003

#### NARX SCORES

Narcotic   Sedative   Stimulant  
**342   210   000**

**NarxCare Scores correspond to the number of literature based risk factors within a set of PDMP data. Low scores generally correspond to smaller amounts of simple data sets.**

## MULTI-DIMENSIONAL RISK REPRESENTATION

Perhaps the primary problem with using PDMP prescription data for every patient at every encounter is the sheer complexity of what is routinely made available. Each line of prescription data can be displayed with 12 or more relevant data fields and it is not uncommon for a PDMP report to contain 50 or more lines of prescription data. From these hundreds (or thousands) of data points, a prescriber or pharmacist is expected to quickly ferret out the details that may represent unacceptable risk.

Not surprisingly, PDMP related research has focused on defining elements of risk that can be counted, and research supports the following PDMP elements as representative of risk:

- The number of providers
- The number of pharmacies
- The amount of medication
- The presence or amount of potentiating medications
- The number of overlapping prescriptions





**Higher scores generally correspond to greater amounts of more complex data sets.**

Published research is often targeted at determining an optimal threshold value for identifying risk. The use of threshold values for each of the above allows for easier application of rules but risk typically exists along a continuous spectrum and the improper use of thresholds can potentially suppress risk awareness. As an example, Yang et al.<sup>1</sup> researched pharmacy shopping and overlapping prescriptions and reported that 4 or more pharmacies in a 90-day window had the highest odds ratio among 9 different definitions of pharmacy shopping. However, Yang, et al. also published that 3 or more pharmacies in 90 days, and 4 or more pharmacies in 180 days both had significantly elevated odds ratios as well. Providers who attribute zero additional risk to patients below a threshold such as 4 or more pharmacies in 90 days fail to recognize the continuous nature of risk and the limitations of choosing arbitrary boundaries.

Yang et. al., also found that combining the pharmacy shopping threshold of 4 or more pharmacies in 90 days with an additional definition of overlapping prescriptions yielded greater predictive power than either measure alone.

Recognizing that risk tends to be continuous and multi-dimensional models tend to be more accurate, NarxCare uses a method to numerically represent multiple determinants of risk within a set of PDMP data to ease the risk analysis burden on clinicians.

1. NarxCare automatically counts literature based risk factors within a PDMP report and assigns the raw values (i.e. number of prescribers, number of pharmacies, MME, etc.) a scaled value between 0 and 99, resulting in a continuous spectrum of risk assignment.



Defining Risk of Prescription Opioid Overdose: Pharmacy Shopping and Overlapping Prescriptions Among Long-Term Opioid Users in Medicaid  
Yang, Zhuo et al. *The Journal of Pain*, Volume 16, Issue 5, 445-453.

NARX SCORES		
Narcotic	Sedative	Stimulant
633	571	000

THREE ACTIVE  
NARCOTIC (OPIOID)  
PRESCRIPTIONS

**The last digit of a NarxCare Score corresponds to the number of active prescriptions of that drug type.**

2. NarxCare weights the amount of medication used (consumption) at 0.5 and the number of prescribers, pharmacies, and overlapping medications (behaviors) at 0.5. This method of representation results in basic NarxCare Score categories as follows:
  - Low consumption + Low behaviors = Low-Range Score
  - Low consumption + High behaviors = Mid-Range Score
  - High consumption + Low behaviors = Mid-Range Score
  - High consumption + High behaviors = High-Range Score
3. The last digit of the three use scores (i.e. Sedative Score 501) corresponds to the number of active prescriptions the patient should have if all medications were taken according to directions.
4. The distribution of NarxCare Scores in the population is:
  - 75% of scores are below 200
  - 5% scores are 500 or above
  - 1% of scores are 650 or above

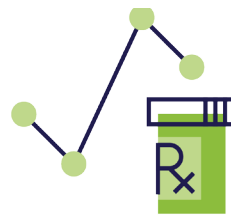
The three Narcotic, Sedative and Stimulant scores allow a provider to rapidly understand the quantity and quality of PDMP information available related to each type of drug. This knowledge can lead the provider to investigate in instances when they might not have otherwise and ultimately identify risky patterns of use, a substance use disorder problem, or an etiology for a presentation they might not have previously considered.



Narcotic Score	Living	Deceased	OR
000 - 099	71,701	80	1
100 - 199	27,153	238	7.9
200 - 299	19,546	220	10.1
300 - 399	21,002	234	10.0
400 - 499	16,303	297	16.3
500 - 599	8,629	305	31.7
600 - 699	3,005	188	56.1
700 - 799	1,062	90	76.0
800 - 899	283	32	101.3
900 - 999	16	3	168.1
<b>Total</b>	<b>168,700</b>	<b>1,687</b>	

## NARXCARE SCORE VALIDATION

The three NarxCare Scores represent the presence of PDMP risk factors within a set of PDMP data. The scores are represented as use scores, as they increase with corresponding increases in the use of providers, pharmacies, milligram equivalents, etc. Given that increased use generally also corresponds with increased risk, they can be expected to represent risk as well.



**The Narcotic Score was found to be strongly associated with unintentional overdose death with progressively higher odds ratios.**



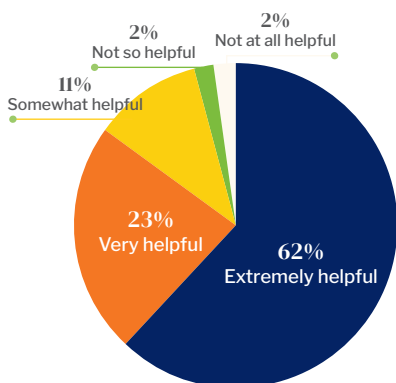


Several studies have been done to validate the NarxCare scores along risk and usability dimensions.

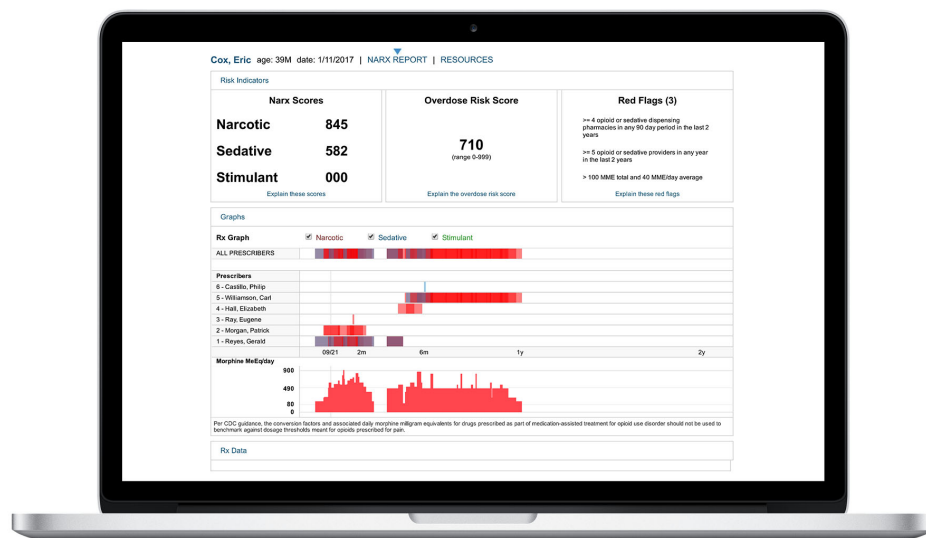
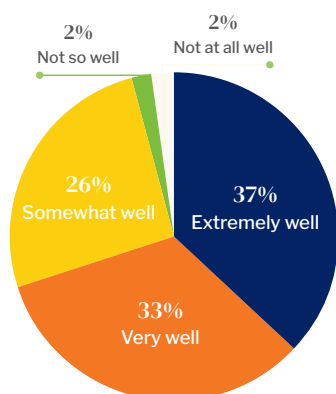
1. An Ohio study that evaluated 1,687 unintentional overdose deaths from the calendar year 2014 found a strong association with the NarxCare Narcotic Score. This study also compared the Narcotic Score with a multi-step manual review process that evaluated three different literature based risk thresholds (More than 5 providers in 1 year, more than 4 pharmacies in 90 days, and more than 40 MED avg). A Narcotic Score threshold of 650 was found to be equivalent to the performance of applying all three manual review metrics while at the same time being much simpler to use.
2. An inline survey that generated over 2,000 in-workflow responses wherein a provider was asked to answer a question about the usability and accuracy of the NarxCare scores and report on the patient they were taking care of.
  - Importantly – When asked about the usefulness of NarxCare scores, 92% of respondents rated them as useful with 61% declaring them extremely useful. These answers were distributed evenly across the entire score range, indicating the critical need to understand PDMP data whether it is sparse or voluminous.
3. A survey of 223 users with a 21% response rate (n = 47) conducted 6 months after going live with NarxCare found similarly high value responses on usability and accuracy.



Survey respondents overwhelmingly believe having NarxCare Scores available for every patient is helpful...



...believe the score represent the underlying PDMP data very well



## DATA VISUALIZATIONS: "A PICTURE IS WORTH A THOUSAND WORDS"

As previously discussed, PDMP data is often presented with hundreds of data points covering multiple dimensions such as who, what, where and when. Important patterns and relationships between these data elements can be very difficult to capture numerically but are easily visualized in a graphical format. NarxCare uses an Rx Graph to convey important patterns of prescriber use, medication type, strength, initiation, duration, and overlap. These patterns can be very informative with just a few seconds of review.

In addition to the patterns and relationships that are displayed on the Rx Graph, providers can click and drag over elements to obtain additional information such as drug name, pharmacy, daily dose, and more.



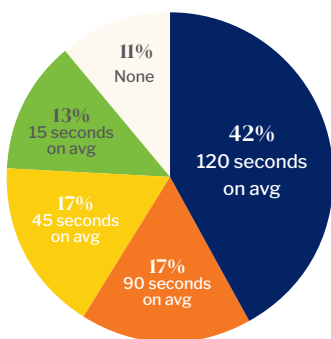




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## FUTURE DIRECTION

**...and estimate large  
time savings when scores  
and data visualizations  
are used to enhance  
understanding**



The NarxCare platform is used to inform providers millions of times a month across the nation. It has been integrated into workflow and used as the default portal platform at the state PDMP level. Numerous advancements are planned or underway to increase the effectiveness of this platform further. These initiatives include:

1. Direct provider to provider communication within the NarxCare application.
2. Enhanced referral tools to rapidly obtain follow up options, or appointments directly within the application.
3. Automated assessment and monitoring tools for clinician use.
4. Non-PDMP data inclusion such as health related criminal justice information, or data from overdose registries.
5. Additional scoring models for outcomes such as misuse, physiologic dependency, and more.
6. Population health surveillance and alerting tools.





*Bamboo Health is making the PDMP a center point for a range of data and technology to maximize the effectiveness of the PDMP in the fight against the drug epidemic.*

## SUMMARY

Bamboo Health’s strategy in the fight against the drug epidemic is to maximally leverage the PDMP and provide the necessary framework and utility to enable PDMP data available up front, for every patient, every time.

This strategy currently includes the automated delivery of a series of validated, numerical scores as well as one-click access to a platform that provides enhanced data visualization and management tools along with the expected detailed prescription data.

The future of PDMP science includes the ability to communicate directly to other providers, the incorporation of relevant non-PDMP data, and the provisioning of valuable assessment, monitoring, and referral services to more effectively aid clinicians in the fight against our nation’s drug epidemic. Bamboo Health is working daily to make this future a reality.





# Bamboo Health



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